

Selecting proper wire size

This section provides guidelines for determining wire gauges to connect a pedestal to a rectifier, DC distribution panel, or other external power equipment.

Typical wire values

Table 21 lists typical wire sizes in AWG and circular mils for a given maximum current. Table 22 lists maximum allowable voltage drops for DC power system conductors.

Table 21
Wire characteristics

Wire gauge (AWG)	Circular mils	Maximum amperes
4	41,750	90
6	26,250	65
8	16,510	50
10	10,380	35
12	6,530	25
Note 1: Maximum amperage is affected by many factors, including temperature and insulation. Consult a wire handbook for precise tables. Note 2: Although gauges smaller than 8 AWG are shown in this table for reference, it is not recommended that sizes smaller than 8 AWG be used for any of the conductors listed in Table 22.		

Table 22
Maximum allowable voltage drops

Conductor	From	To	Allowable Voltage drop (max)
– Battery	Pedestal	– Distribution discharge	1.00
+ Battery return	Pedestal	+ Distribution ground	1.00
– Battery	Distribution	– Battery terminal	0.25
+ Battery return	Distribution	+ Battery terminal	0.25
– Battery	Rectifier	– Distribution charge	0.50
+ Battery return	Rectifier	+ Distribution ground	0.50
Note: “Distribution” means the DC power distribution panel (box).			

Metric conversion

AWG measurements are not directly related to European Industry standard metric measurements. The following table provides guidance when converting from the AWG system to the Metric system for the most commonly used power and ground conductor cables.

Table 23
Metric wire conversion

AWG NO	Industry standard Nominal (Sq mm)	Resistance at 20 deg.C. (Ohm/100m)
2	35	0.05
4	25	0.08
6	16	0.13
8	10	0.20
10	6	0.33
12	4	0.63
14	2.5	1.00
16	1.5	1.40
18	1	2.00
20	0.75	2.90
22	0.5	4.60

Sense lead wire size

When sense leads are required, the loop resistance of the wire used to connect the $\pm$ sense terminals at the rectifiers or DC distribution panel to the $\pm$ terminals of the batteries must not exceed 2.5 ohms.

Calculating wire size

Using the maximum current in a conductor, determine the length that the conductor must be to meet the required maximum voltage drop. When you know the current, distance, and allowable voltage drop for a specific conductor, you can calculate the minimum wire size using the following formula:

$$CM = \frac{11.1 \times I \times D}{V}$$

where

- CM = wire size required in circular mils
- I = current in amperes (use the maximum expected)
- D = distance in feet (to convert meters to feet, divide by 0.3048)
- V = maximum allowable voltage drop

CAUTION

Although the voltage drops listed in Table 22 are the maximum drops allowed, the insulation and temperature rating versus current often dictates a wire size that creates smaller voltage drops on short lengths. After using the formula, check the wire tables to make sure the temperature rise is acceptable.

The following examples show wire size calculations using the formula given above:

— Example 1

A battery or battery return conductor from a DC distribution panel to a pedestal is 11.0 m (36 ft.) long and must carry a maximum of 30 A with voltage drop of no more than 1V:

$$CM = \frac{11.1 \times 30 \times 36}{1} = 11,988$$

- Choosing a standard gauge equal to or larger than this requires #8 AWG, which has a cross section of 16,510 circular mils.

— Example 2

A battery or battery return conductor from a DC distribution panel to the battery is 7.6 m (25 ft.) long and must carry a maximum of 35 A:

$$CM = \frac{11.1 \times 35 \times 25}{0.25} = 38,850$$

- Choosing a standard gauge equal to or larger than this requires #4 AWG, which has a cross section of 41,740 circular mils.

Input wire size

Table 24 provides a means for determining the size of wire used to connect the distribution box and the pedestal. A maximum total voltage drop of two volts is allowed between the pedestal and the external power equipment. Table 24 lists cable sizes that give acceptable voltage drops for a given cable length, and those that do not.

Note: Conduit is not necessary with the NT7D67CB PDU.

Table 24
Pedestal wire gauge requirements with two 30 A feeds (five wires)

Length	#8 AWG	#6 AWG	Single #4 AWG	Double #4 AWG
0–3 m (10 ft)	Yes	Yes	Yes	Yes
3–6 m (20 ft)	Yes	Yes	Yes	Yes
6–9 m (30 ft)	Yes	Yes	Yes	Yes
9–12 m (40 ft)	Yes	Yes	Yes	Yes
12–15 m (50 ft)	Yes	Yes	Yes	Yes
15–18 m (60 ft)	No	Yes	Yes	Yes
18–21 m (70 ft)	No	Yes	Yes	Yes
21–24 m (80 ft)	No	Yes	Yes	Yes
24–27 m (90 ft)	No	No	Yes	Yes
27–30 m (100 ft)	No	No	Yes	Yes
30–60 m (200 ft)	No	No	No	Yes
over 60 m (200 ft)	No	No	No	No
Note: Two 30 A feeds are typically adequate for a column with four modules (five wires total—two 30 A feed pairs, BAT(–) and BATRTN(+), plus logic return, LRTN(+). Legend: Yes = Wire size is adequate for the distance. No = Wire size has too high a voltage drop and is inadequate for the distance.				